Claims

1. A multi-aperture interferometric optical system formed of multiple sets of mirrors mounted on support structures operatively coupled to a platform, the optical system defining a system optical axis and the multiple sets of mirrors cooperating to point the system optical axis at an angle relative to nadir without moving the platform on which the optical system is supported, comprising:

a first set of primary mirrors arranged along a first periphery to receive incident electromagnetic radiation propagating from a target subject to be imaged, the primary mirrors operatively associated with a first positioning mechanism to effect directional pointing of the system optical axis toward the target subject;

a detector configured to acquire radiation pattern information from the electromagnetic radiation received from the target subject;

a second set of secondary mirrors arranged along a second periphery and a third set of tertiary mirrors arranged along a third periphery, the second and the third sets of mirrors positioned to receive electromagnetic radiation reflected by the primary mirrors receiving the incident electromagnetic radiation and to steer the reflected radiation for radiation pattern information acquisition by the detector, the second and the third sets of mirrors being operatively associated with second and third positioning mechanisms to contribute to adjustment of optical path lengths and preservation of a common effective focal length of the radiation reflected by the primary mirrors and incident on the detector; and

a quaternary mirror set positioned to receive the radiation steered by the second and third sets of mirrors and direct it toward the detector for radiation pattern information acquisition.

2. The optical system of claim 1, in which the angle relative to nadir ranges from zero degrees to about 10 degrees.

3. The optical system of claim 1, in which each primary mirror in the first set has a corresponding secondary mirror and a corresponding tertiary mirror that define a mirror arm having an optical path length segment and an effective focal length segment, the second and third positioning mechanisms operatively associated with the corresponding secondary and tertiary mirrors providing adjustment of the optical path length and effective focal length segments.

4. The optical system of claim 3, further comprising a controller operatively associated with the second and third positioning mechanisms to adjust the optical path length

and effective focal length segments of the mirror arms to achieve a common pointing path along the system optical axis at the angle relative to nadir.

5. The optical system of claim 3, in which failure of a mirror in one of the first, second, and third sets defining a mirror arm interrupts propagation of radiation along the mirror arm to the detector.

6. The optical system of claim 1, in which:

each of the first, second, and third peripheries is in the form of a ring; and

adjacent mirrors in the first, second, and third sets are mutually spaced apart from each other by nonuniform distances.

7. The optical system of claim 1, in which the detector includes multiple detector elements each viewing a radiation pattern bandpass of predetermined wavelength range.

8. The optical system of claim 7, in which the radiation pattern bandpasses range from visible light to the near-infrared light.

9. The optical system of claim 1, in which the detector comprises a charge-coupled device of a channel amplification type.

10. The optical system of claim 1, in which each of the second and third positioning mechanisms comprises an extensible piston mechanism.

11. The optical system of claim 1, in which the first, second, and third sets of mirrors are arranged such that the positions of the secondary mirrors depend on the positions of the primary mirrors and in which the positions of the tertiary mirrors depend on the positions of the primary mirrors and secondary mirrors to point the system optical axis at the angle relative to nadir.

12. The optical system of claim 1, in which the quaternary mirror set includes multiple quaternary mirrors arranged along a periphery to receive electromagnetic radiation reflected by the tertiary mirrors.

13. The optical system of claim 1, in which the quaternary mirror set includes a single quaternary mirror positioned to receive electromagnetic radiation reflected by the tertiary mirrors.

14. A multi-aperture interferometric optical system formed of multiple sets of mirrors mounted on support structures operatively coupled to a platform, the optical system defining a system optical axis and the multiple sets of mirrors cooperating to point the system optical axis at an angle relative to nadir without moving the platform on which the optical system is supported, comprising:

first and second sets of multiple mirrors configured to receive incident electromagnetic radiation propagating from a target to be imaged, the mirrors in the first and second sets steering the electromagnetic radiation such that it propagates along multiple optical paths for incidence on a detector; and

a positioning system operatively associated with the first and second sets of mirrors to move them in a coordinated manner to maintain a common effective focal length of radiation propagating along the multiple optical paths in response to a change in the angle between the system optical axis relative to nadir and thereby provide a coherent radiation pattern at the detector.

15. The optical system of claim 14, in which the first and second sets of mirrors are arranged along peripheries of respective first and second ring structures.

16. The optical system of claim 14, in which the detector comprises a charge-coupled device of a channel amplification type.

17. The optical system of claim 16, in which the detector includes multiple detector elements, each viewing a radiation pattern bandpass of predetermined wavelength range.